

QUALITY ASSURANCE SYSTEM AND METHOD

BACKGROUND

The present invention relates to a quality assurance system and method, and particularly to a quality assurance system and method that check the quality assurance (QA) of goods on a service provider by a control center via the Internet.

A business model is wellknown as OEM (Original Equipment Manufacturer), in which a product is composed of a plurality of components, and produced by several participators. In addition, in the semiconductor industry, wafers must pass a plurality of process stages in an IC (Integrated Circuit) foundry, and may be tested and packed by a service provider, such as a contractor that concentrates to run test and pack business. After the test, pack and quality assurance stages in the service provider, the wafers become finished goods and are shipped to specific destinations or customers.

The quality issue between the participators is difficult to be controlled and monitored, and there is no mechanism for quality assurance management between the participators. In the conventional mechanism, the quality assurance check is performed respectively and independently, that is the customer fully trusts the service provider's quality assurance check, and performs its own quality assurance check by only checking the surface of the goods.

However, there may be mistakes in the service provider. For example, the service provider may use wrong test programs to circuit probe (CP) test the wafers, thereby affecting the yield and increasing related costs. At TSMC (Taiwan Semiconductor Manufacturing Company), since there are over 50,000 probe wafers

that are externally tested by the service provider, a very high potential risk exists if the service provider misses the standard recipes; also, it will impact the business reputation of TSMC and result in money lost for clients.

5 In addition, the service provider has a sequence of process stages, and the processed goods may be the only quality assurance check in the final stage. Since there is no effect mechanism for early detection of quality fail in real time, the damage may be relative high and the recovery measure used to
10 recover the failed goods may be complicated if the goods are processed by the wrong recipes.

SUMMARY

15 It is therefore an object of the present invention to provide a system and method that check the quality assurance of goods on a service provider by a control center via the Internet.

 It is another object of the present invention to provide an early detection mechanism to discover the quality fail on a service provider in real time.

20 To achieve the above objectives, the present invention provides a quality assurance system and method. The system includes a service provider and a control center. The service provider has at least a first process stage and a second process stage. The service provider performs a process on goods at the first process stage, transfers engineering data corresponding
25 to the process to the control center via the Internet, and holds the goods at the first process stage. The control center compares the engineering data with a standard specification, and transfers a confirmation message to the service provider if the engineering data conforms to the standard specification. The

service provider may release the goods to the second process stage after the confirmation message is received.

In addition, the control center transfers a fail message to the service provider if the engineering data does not conform to the standard specification, and the service provider performs a recovery measure on the goods if the fail message is received.

Further, the quality assurance method first performs a process on goods at a first process stage by the service provider. Then, the service provider transfers engineering data corresponding to the process to the control center via the Internet, and holds the goods at the first process stage. Thereafter, the control center compares the engineering data with a standard specification for confirming quality of the goods. If the engineering data conforms to the standard specification, the control center transfers a confirmation message to the service provider via the Internet. After the confirmation message is received, the service provider releases the goods to a second process stage.

Similarly, the control center transfers a fail message to the service provider if the engineering data does not conform to the standard specification, and the service provider performs a recovery measure on the goods if the fail message is received.

One feature of an embodiment of the present invention is a check of the quality assurance of goods on a service provider by a control center via the Internet. Another feature of an embodiment of the present invention is early detection of the quality fail on the service provider in real time.

BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned objects, features and advantages of this invention will become apparent by referring to the following detailed description of the preferred embodiment with reference to the accompanying drawings, wherein:

Fig. 1 is a schematic diagram illustrating the architecture of the present invention;

Fig. 2 is a schematic diagram illustrating the system architecture of the quality assurance system according to the present invention;

Fig. 3 is a flowchart showing the process of the quality assurance method according to a first embodiment of the present invention; and

Fig. 4 is a flowchart showing the process of the quality assurance method according to a second embodiment of the present invention.

DESCRIPTION

As summarized above, the present invention provides a system and method overcoming conventional quality assurance problems.

As will be appreciated by persons skilled in the art from the discussion herein, the present invention has wide applicability to many manufacturers, factories and industries. For discussion purposes, the embodiments are made herein to semiconductor foundry manufacturing (i.e., wafer fabrication in an IC foundry). However, the present invention is not limited thereto.

Fig. 1 is a schematic diagram illustrating the architecture of the present invention. The present invention can be applied

to worldwide environment through the Internet. As shown in Fig. 1, the system of the present invention includes a control center 100, and a plurality of service providers 200, 201 and 202 coupled with the control center 100 via the Internet 250, in which the control center 100 may be an IC foundry or inside the IC foundry, and the service providers may be contractors of the IC foundry that concentrate to run test and pack business. It is understood that the service providers may apply to any factories, and not be limited thereto.

Fig. 2 is a schematic diagram illustrating the system architecture of the quality assurance system according to the present invention. It is understood that, the operations between one service provider and the control center are discussed in the embodiments, the operations between other service providers and the control center are similar and omitted here.

The quality assurance system includes a control center 100 and a service provider 200 coupled to the control center 100 via the Internet 250. The control center 100 includes a management unit 110, a spec database 120 and an engineering data database 130. The spec database 120 may record standard specifications, such as identities of lots and wafers, stage names of each process stage, and process information, such as test program or name thereof of each process at respective process stages. The engineering data database 130 stores engineering data transferred from the service provider 200.

The service provider 200 has a control unit 210, a recipe database 220 and a sequence of process stages 230 including process stages (S1, S2, ...) and a quality assurance stage (QA). The control unit 210 may receive recipes, such as identities of lots

and wafers, and test programs of each test process at respective process stages from the control center 100 in advance, and stores it to the recipe database 220. When the wafers need to be circuit probe tested, the control unit 210 may retrieve corresponding recipes from the recipe database 220. In addition, the control unit 210 may collect engineering data corresponding to the processes, and transfers it to the control center 100 for quality assurance check.

Fig. 3 is a flowchart showing the process of the quality assurance method according to a first embodiment of the present invention. In the first embodiment, the present invention provides an early detection mechanism to discover the quality fail on each process stage of the service provider 200 in real time.

First, in step S301, the service provider 200 performs a test process on goods (lots of wafers) at the first process stage S1 using a corresponding test program retrieved from the recipe database 220. At the same time, the control unit 210 collects the engineering data corresponding to the test process at the first process stage S1. Then, in step S302, the service provider 200 holds the goods at the first process stage S1, and in step S303, transfers the engineering data to the control center 100 via the Internet 250. Thereafter, in step S309, the service provider 200 checks whether a message is received or not.

In addition, in step S304, the control center 100 checks whether the engineering data is received from the service provider 200. If no (No in step S304), the control center 100 continues the determination of step S304. If the engineering data is received (Yes in step S304), in step S305, the control center 100 stores the engineering data to the engineering data

database 130, and compares the engineering data with a standard specification in the spec database 120 for confirming the quality of the goods at the first process stage S1, in which the engineering data may include the identities of the goods, stage
5 name of the first process stage S1, and process information, such as the name of the test program used in the first process stage S1.

If the engineering data conforms to the standard specification (Yes in step S306), in step S307, the control
10 center 100 transfers a confirmation message to the service provider 200 via the Internet 250. Otherwise (No in step S306), in step S308, the control center 100 transfers a fail message to the service provider 200 via the Internet 250.

After the message is received by the service provider 200
15 (Yes in step S309), in step S310, it is determined that whether the received message is a confirmation message or a fail message. If the received message is a confirmation message, in step S311, the service provider 200 releases the goods to the second process stage S2. If the received message is a fail message, in step
20 S312, the service provider 200 performs a recovery measure on the goods to recover the good, and the flow returns to step S303 for further quality assurance check. It is understood that after the goods are released to the second process stage S2, the flow repeats from steps S301 to S312 again until all of the process
25 stages are finished.

Fig. 4 is a flowchart showing the process of the quality assurance method according to a second embodiment of the present invention. In the second embodiment, the quality assurance check is performed on the quality assurance stage.

First, in step S401, the service provider 200 performs test processes on goods through all of the process stages using corresponding test programs retrieved from the recipe database 220. At the same time, the control unit 210 collects the engineering data corresponding to the test processes of each process stage. Then, in step S402, the service provider 200 holds the goods at the quality assurance stage, and in step S403, transfers the engineering data to the control center 100 via the Internet 250. Thereafter, in step S409, the service provider 200 checks whether a message is received or not.

In addition, in step S404, the control center 100 checks whether the engineering data is received from the service provider 200. If no (No in step S404), the control center 100 continues the determination of step S404. If the engineering data is received (Yes in step S404), in step S405, the control center 100 stores the engineering data to the engineering data database 130, and compares the engineering data with a standard specification in the spec database 120 for confirming the quality of the goods, in which the engineering data may include the identities of the goods, stage name of the each process stage, and process information, such as the name of the corresponding test program used in respective process stage.

If the engineering data conforms to the standard specification (Yes in step S406), in step S407, the control center 100 transfers a confirmation message to the service provider 200 via the Internet 250. Otherwise (No in step S406), in step S408, the control center 100 transfers a fail message to the service provider 200 via the Internet 250.

After the message is received by the service provider 200 (Yes in step S409), in step S410, it is determined that whether

the received message is a confirmation message or a fail message.
If the received message is a confirmation message, in step S411,
the service provider 200 may ship the goods to specific
destinations or customers. If the received message is a fail
5 message, in step S412, the service provider 200 performs a
recovery measure on the goods to recover the good, and the flow
returns to step S403 for further quality assurance check.

As a result, using the quality assurance system and method
according to the present invention, the quality assurance issue
10 between the control center and service providers can be
controlled and monitored via the Internet. In addition, the
quality fail of each process stage can be early discovered in
real time.

Although the present invention has been described in its
15 preferred embodiments, it is not intended to limit the invention
to the precise embodiments disclosed herein. Those who are
skilled in this technology can still make various alterations
and modifications without departing from the scope and spirit
of this invention. Therefore, the scope of the present invention
20 shall be defined and protected by the following claims and their
equivalents.